ILRS Consolidated laser Ranging Data (CRD) format
Validation Procedures

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To implement the CRD format, each station must go through a validation procedure. The rest of this document describes the process in detail. As the procedure evolves, this document will be updated.

1) The station must modify software to produce the CRD format and test its implementation using programs included in the sample code found on the CRD page of the ILRS website (http://ilrs.gsfc.nasa.gov/products_formats_procedures/crd.html). Specifically, these programs are

a. Crd_chk: test normal point, full-rate, and sampled engineering (if produced) files for format compliance.

b. Crd_cstg_np_cmp: compares normal point files in the new and old format for consistency.

c. Crd_merit_fr_cmp: compared full-rate file in new and old formats for consistency.

These last 2 tests produce reports assigning a grade and detailing differences. Generally, the full-rate tests should be passed without difficulty. Normal point tests will sometimes have difficulties due to potential accuracy differences in data files. It is the stations' responsibility to explain these differences.

Once a station is satisfied with the quality of their CRD product, they can proceed to the next step, the delivery of CRD data to their operations center (OC) and request to be validated (see next step).

2) To begin the ILRS validation of the CRD data,

2)a. The station should contact their OC (HTSI or EDC) with the starting date of CRD-formatted file delivery.

2)b. Until notified by the OC, the station should send data in both the CRD and the old format in parallel.

2)c. The data in the old format will be distributed immediately, as usual.

2)d. The data in the new format will be subject to a 3-phase testing procedure. If there are problems during any phase, the OC or an analysis center (AC) will contact the station directly for resolution of the problem. This period is anticipated to last about 30 days.

2)e. At the end of the validation testing the OPERATIONS CENTER will formally notify the station to continue sending CRD data and discontinue sending old-format data.

3) The phases in the validation procedure are as follows. Note that the CRD data will not be released to the community at large until all tests have been passed and the station notified. The test CRD data will be sequestered in special directories on the OC computer systems. When phases 3)a and 3)b below are successfully completed, the data will be forwarded to the data centers (DCs) and made available in hidden directories for the analysts to examine.

3)a. The OCs will run the 3 pieces of software discussed in 1) above and any other available QC software on the CRD files. The crd_cstg_np_cmp test will flag normal point files with: strong pass, pass, marginal, or fail. The first 2 categories can be accepted without reservation. The other 2 categories will require some care. As mentioned above, marginal or fail designations may just be the result of changes in filtering caused by changes in precision and resultant changes in the normal point fits.

3)b. All CRD and corresponding old-format normal point data will then be run through short arc tests by the OCs. For example, HTSI can run the data through GEODYN. As to the fine points, the OC may have to convert the CRD data back into old-format data to be read by the short arc program. The station IDs of either the CRD or old format data should be changed to allow comparisons between the data sets. Finally, the fits of both data sets should be inspected to insure that they differ by no more than TBD mm. The O-C residual for the same passes in the 2 formats should be checked for any anomalies above TBD mm. Particular attention should be given to those passes with marginal or failing grades in the step 3) a. Stations should be contacted directly if there are any serious differences between the data sets.

3)c. When the OCs are satisfied with the first 2 weeks of CRD data from a station, the data will be placed in hidden directories on the CDDIS by station and satellite. The participating analysis centers should then be contacted to pick up any data they wish to examine. Currently confirmed ACs are ASI, GRGS, and DGFI, all of which use different analysis software, but additional ACs are expected to join this group as they are able to "ingest" CRD formatted data. The analysts should look at this data as was done in step 3) b to insure there are no systematic differences between the old and new format data sets. If any AC finds serious problems, it should contact the station directly (cc-ing the OC).

3)d. By the end of 2 weeks of CRD data examination, each participating AC should inform the OC whether or not the station has passed the test and submit a summary report on the examined data. OCs should contact ACs directly if there has been no report after 2 weeks.

4) Once a station's CRD data has been validated, all CRD data received up to that point and all future CRD data will be placed in the public CRD directories in the ILRS DC archives. CRD data distribution will utilize existing procedures for data flow, e.g., hourly and daily files containing all data released in the previous 1 and 24 hour period respectively. ILRS DCs will maintain separate archives of CRD-formatted data in satellite and yearly subdirectories. DCs will create monthly files containing all CRD data received for each satellite.

5) A page will be maintained on the ILRS web site with the status of each station's conversion process (http://ilrs.gsfc.nasa.gov/products_formats_procedures/crd_station_status.html).

6) Until December 31, 2008, all new CRD data from validated stations will be converted to the old format by the OCs (sample code already exists), and the converted files will also be placed in the DC archives.

7) Contrary to previous discussions, old-format data will NOT be converted to CRD data for non-validated stations. Presumably, once an analysis center has learned to read CRD files, it will not forget how to read the old-format data.

8) Full-rate data (for those stations that submit it) will be considered validated if all files pass the old/new format full-rate test ("strong pass" or "pass").

9) The schedule for implementation is as follows.

Now:	Announcement of CRD schedule and procedures; Stations and Analysis Centers should begin the conversion process, using the furnished software to verify their processes;
October 15:	HTSI will be ready to accept data in CRD format and provide quality control scrutiny and new/old NP data validation; As they are ready, stations can start submitting data in CRD in addition to the old formats to HTSI or EDC; verification by the Operations Center will require about 30 days from the date of submission;
December 1:	Selected Analysis Centers will be ready to compare and scrutinize the data in both the old and new formats for stations in the routine analysis process; this validation activity should take about 30 days;
April 15, 2009:	All stations must submit data in the CRD format;
Dec 31, 2009:	All submission of the old format will cease. Only data in CRD format will be submitted to and archived at the data files at the Data Centers.